

WHAT IS CLAIMED IS:

1. A process for producing ϵ -caprolactone by the oxidation of cyclohexanone, comprising the steps of:
 - feeding a crude reaction mixture to a first distillation column; and
 - recovering a first side-cut fraction containing unreacted cyclohexanone from an intermediate tray of the first distillation column.
2. A process for producing ϵ -caprolactone by the oxidation of cyclohexanone, comprising the steps of:
 - feeding a crude reaction mixture to a first distillation column;
 - distilling off a first distillate from the top of the first distillation column, the first distillate containing low boiling components including unreacted cyclohexanone;
 - recovering a first side-cut fraction from an intermediate tray of the first distillation column, the first side-cut fraction containing unreacted cyclohexanone in a higher concentration than in the first distillate;
 - recovering a first bottom liquid from the bottom of the first distillation column, the first bottom liquid containing high boiling components including ϵ -caprolactone;
 - introducing the first side-cut fraction to a second

distillation column;

recovering a second bottom liquid containing unreacted cyclohexanone from the bottom of the second distillation column;

recycling the second bottom liquid into the raw material cyclohexanone;

introducing the first bottom liquid to a third distillation column to thereby yield a third distillate containing ϵ -caprolactone from the third distillation column.

3. The process according to one of claims 1 and 2, further comprising oxidizing cyclohexanone with a peracid.

4. The process according to claim 3, wherein the peracid is an organic peracid.

5. The process according to claim 4, wherein the organic peracid is peracetic acid.

6. The process according to claim 3, wherein the crude reaction mixture mainly comprises the peracid, an acid derived from the peracid, a solvent for the peracid, cyclohexanone, ϵ -caprolactone, adipic acid, and a polymerized product of ϵ -caprolactone.

7. The process according to claim 3, wherein the first side-cut fraction mainly comprises the peracid, an acid derived from the peracid, a solvent for the peracid, and cyclohexanone.

8. The process according to claim 3, wherein the first distillate mainly comprises the peracid, an acid derived from the peracid, a solvent for the peracid, and cyclohexanone.

9. The process according to claim 3, wherein the first bottom liquid mainly comprises ϵ -caprolactone, adipic acid, and a polymerized product of ϵ -caprolactone.

10. The process according to claim 3, wherein the second bottom liquid mainly comprises an acid derived from the peracid and unreacted cyclohexanone.

11. The process according to claim 3, wherein the third distillate mainly comprises ϵ -caprolactone.